

26 DECEMBER 2003



Aerospace Medicine

IONIZING RADIATION PROTECTION

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Supersedes RABI 48-102, 1 May 1998.

Pages: 13
Distribution: F

This instruction specifies the requirements for protection of 86th Airlift Wing (86 AW) personnel and their dependents from ionizing radiation, as well as supported units. It also specifies requirements to protect the general public from exposure to ionizing radiation resulting from USAF activities. It implements AFI 48-148, *Ionizing Radiation Protection*, AFI 40-201, *Managing Radioactive Materials in the USAF*, AFI 91-108 and USAFE Supplement 91-108, *Air Force Nuclear Weapons Intrinsic Radiation Safety Program*, and AFI 48-125, *US Air Force Personnel Dosimetry Program*. This instruction applies to all Air Force military and civilian personnel working at Ramstein Air Base, as well as 86 AW annexes and support sites. It does not apply to exposure of patients during diagnostic or therapeutic medical procedures. Implementation of this safety program, and the As Low As Reasonably Achievable (ALARA) concept must not compromise weapons safety, security, reliability, or operational mission considerations.

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

1. Purpose. This instruction establishes responsibilities, policies, and procedures necessary to protect workers and the community from ionizing radiation hazards, to maintain exposures to ALARA, and to ensure effective monitoring and medical follow-up of personnel. Elements of the Ramstein AB ionizing radiation safety program include: ALARA, personnel thermoluminescent dosimetry (TLD), radioactive material (RAM) permits, x-ray devices, RAM storage areas, RAM shipment/receiving, RAM recycling/disposal, depleted uranium (DU) munitions, and intrinsic radiation (INRAD).

2. Responsibilities

2.1. **86 AW Commander shall:** Designate, in writing, a qualified individual to be installation radiation safety officer (RSO) and alternate.

2.2. **Organizational or Unit Commander shall:**

2.2.1. Identify and obtain approval for new activities or significant changes to activities involving the use/storage of ionizing radiation sources through the installation radiation safety officer. Provide updates on changes to these activities or mission requirements.

2.2.2. For units potentially exposed to ionizing radiation, designate, in writing, an organizational or unit RSO and alternate, and update as needed. Ensure the most qualified personnel are appointed. The letter must include the rank, name, telephone number, and date estimated return from overseas (DEROS). Send a copy to the appointed individual and to the Installation RSO (86 AMDS/SGPB). The following appointments, at a minimum, should be made:

2.2.2.1. The 86th Medical Support Squadron commander will appoint:

2.2.2.1.1. A functional area RSO and alternate for Radiology.

2.2.2.1.2. A functional area RSO and alternate for Biomedical Equipment Maintenance.

2.2.2.2. The 86th Dental Squadron commander will appoint a unit RSO and alternate for Dental X-ray.

2.2.2.3. The 86th Contingency Response Group commander will appoint a unit/permit RSO and alternate for Environmental Medicine Flight.

2.2.2.4. The 86th Maintenance Squadron commander will appoint:

2.2.2.4.1. A functional area RSO and alternate for Non-Destructive Inspection (NDI).

2.2.2.4.2. A functional area RSO and alternate for Priority Maintenance.

2.2.2.4.3. A function area RSO and alternate for Munitions Storage.

2.2.2.4.4. A function area RSO and alternate for Munitions Inspection.

2.2.2.5. The 86th Civil Engineer Squadron (CES) commander will appoint:

2.2.2.5.1. A functional area RSO and alternate for Readiness Flight.

2.2.2.5.2. A functional area RSO and alternate for Explosive Ordnance Disposal (EOD) Flight.

2.2.2.6. The 86th Logistic Readiness Squadron commander will appoint:

2.2.2.6.1. A functional area RSO and alternate for Storage and Issue.

2.2.2.6.2. A functional area RSO and alternate for Packing and Crating.

2.2.2.7. The 723rd Air Mobility Squadron commander will appoint:

2.2.2.7.1. A functional area RSO and alternate for Special Handling.

2.2.2.7.2. A functional area RSO and alternate for Passenger Services.

2.2.2.8. The 86th Security Forces Group commander will appoint a unit RSO and alternate.

2.2.2.9. The 37th Airlift Squadron commander will appoint a unit RSO and alternate.

2.2.2.10. The USAFE CTS commander will appoint a unit RSO and alternate for Readiness/Contingency Training.

2.2.3. Ensures unit, functional area, or permit RSOs conduct annual radiation safety training for individuals who may be exposed at or above 10% of the action level or where directed.

2.2.4. Ensures local operating instructions (OI) are maintained and implemented when required by technical order or by the installation RSO.

2.3. Installation RSO shall

2.3.1. Review plans for new construction or modification of facilities, which involve the use, or storage of radioactive material or radiation-producing devices to ensure the ALARA concept is considered.

2.3.2. Review, survey, monitor, and document ionizing radiation activities and program elements in accordance with Air Force policy, or as need determines.

2.3.3. Conduct a dosimetry program for personnel whose exposure could exceed 10 percent of the occupational exposure limits or who meet one of the other monitoring requirements described in AFI 48-125 Chap. 3. Distribute copies of personnel dosimetry results to functional area RSOs, and ensure notification of ionizing radiation exposure is provided to all monitored individuals.

2.3.4. Train unit, functional area, and permit RSOs as requested.

2.3.5. Review all applications including amendments, for USAF radioactive material permits.

Review requests for introduction of new activities or changes to existing activities, which involve the use of ionizing radiation.

2.3.6. Ensure unit, functional area, and permit RSOs are qualified.

2.3.7. Review/approve the contractor use of German or Nuclear Regulatory Commission (NRC)-licensed radioactive materials at Ramstein AB or 86 AW support sites.

2.3.8. Coordinate with and assist users with recycling and/or disposal of all radioactive materials.

2.3.9. Investigate suspected overexposure or abnormal exposure to ionizing radiation.

2.3.10. Determine the need for local OIs. Review and approve OIs prepared by unit, functional area, and/or permit RSOs.

2.3.11. Annually notify Wing Commander, Fire Chief, and 86 CES Readiness Flight of locations of radioactive material and of any significant moves of radioactive material in a timely fashion.

2.3.12. Periodically review radioactive material shipments logs.

2.3.13. Report transportation/shipment packaging related incidents/accidents involving radioactive material to the 86 AW Dangerous Goods Advisor (DGA) IAW 86 AWI 24-203.

2.4. Unit, functional area, and permit RSO shall

2.4.1. Complete and submit USAF Radioactive Material Permit applications and amendment requests through the installation RSO, if applicable.

2.4.2. Consider ALARA when reviewing plans for modification of existing facilities, or design of new facilities involving use of radioactive materials or radiation-producing devices. Obtain

approval from the installation RSO on all projected changes regarding use of radiation-producing devices or radioactive material prior to their implementation.

2.4.3. Routinely inventory all areas where radioactive materials or radiation-producing devices are used or stored to ensure no unexpected changes occur, and to ensure they remain in accordance with requirements of USAF Radioactive Material Permits and Air Force directives. Inventories should be documented in accordance with the permit and countersigned by the installation RSO.

2.4.4. Develop and implement local OIs when required to do so by technical order or the installation RSO. Submit OIs to the installation RSO for review and indorsement.

2.4.5. Conduct annual radiation safety training, as required. [Attachment 1](#) can be used for this purpose. Other training resources (i.e. training videos, computer-based training, area-specific training, etc) are available through the installation RSO. A written training plan shall be developed/maintained, and approved by the installation RSO. Document training on an AF Form 55, or equivalent, and ensure training documentation is available for review by the installation RSO upon request. Training shall include, as applicable:

2.4.5.1. Types and characteristics of radiation of concern.

2.4.5.2. Radioactivity, radioactive decay or x-ray production (as appropriate).

2.4.5.3. Modes of exposure-internal vs. external.

2.4.5.4. Health risks posed by exposure including: deterministic and stochastic effects, and somatic and genetic effects and effects on the unborn fetus.

2.4.5.5. General radiation protection principles including: ALARA and dose limits; external protection through time, distance, and shielding; and internal protection through respiratory protection, protective clothing and hygiene, as appropriate.

2.4.5.6. Use of instruments, equipment, and personal dosimetry, as appropriate, to: identify sources of radiation emission; measure radiation exposure rates or dose rates; and monitor individual radiation doses.

2.4.5.7. Emergency procedures.

2.4.5.8. Reporting requirements.

2.4.5.9. RAM permit requirements, as appropriate.

2.4.5.10. Other occupation-specific hazards and the related skills and procedures that are required for working with the RAM or radiation-producing devices of concern.

2.4.6. Follow proper recycling/disposal procedures. Coordinate recycling/disposal through 86 AMDS/SGPB.

2.5. Base Civil Engineer shall: Ensure the installation RSO, and other RSOs with a vested interest, review plans for modification of facilities, which involve the use of radioactive material or radiation-producing devices.

2.6. USAFE Contracting Squadron (USAFE CONS) shall: Review functional activities requirements package to ensure it has been reviewed by the installation RSO when the delivery or use of RAM is involved in contract performance. During administration of the contract, USAFE CONS shall ensure contractor compliance with RAM requirements of the contract.

2.7. 86 CES Contracting Management Offices shall: Ensure installation RSO has coordinated on the statement of work for all construction and services contracts potentially involving the use of RAM and/or x-ray equipment. Ensure contractors using RAM on Air Force installations have installation RSO approval prior to bringing RAM or radiation-producing devices onto Air Force controlled property. The contractor shall contact the installation RSO at least 30 days prior to the intended use; so adequate time is provided to ensure proper licensing or permitting.

2.8. 86 LRS, and 723 AMS shall:

2.8.1. Develop written instructions ensuring all radioactive materials are received, stored, packaged, and shipped according to AFJMAN 24-204, *Preparing Hazardous Materials for Military Air Shipments*, T.O. 00-110N-3, 10 Code of Federal Regulations (CFR), 49 CFR, 86 AWI 24-203 and other publications. Procedures shall include notifying Bioenvironmental Engineering (BE) within three hours of receiving radioactive shipments. Priority “999” packages will be surveyed after hours by contacting the BE on-call technician at 0160-5845480 or via Command Post.

2.8.2. Maintain a log of all radioactive shipments and receipts. This log will contain information required by the installation RSO.

2.8.3. Maintain an approved temporary storage area for RAM and radioisotope-containing commodities.

3. Radiation Incidents.

3.1. Overexposure Incidents.

3.2. Potentially overexposed worker shall: Report immediately to a primary care manager for a physical examination. The physician will complete SF Form 513, Medical Record - Consultation Sheet, and generate an AF Form 190, Occupational Illness/Injury Report.

3.3. Worker shall: Immediately notify the unit RSO whenever a suspected overexposure or incident occurs. The unit RSO will notify the installation RSO (479-2220 during duty hours, and either 0171-4831499 or 0160-5845480 after duty hours) within 3 hours.

3.4. Unit RSO shall: Obtain a signed, narrative statement from the exposed worker and witnesses immediately. The statement will include:

3.4.1. Name, rank, and SSAN of exposed worker.

3.4.2. Radiation source - include activity (or power settings if X-ray source).

3.4.3. Brief description of event.

3.4.4. Length of exposure.

3.4.5. Distance from source.

3.4.6. Description of medical or follow-up action.

3.4.7. Name, rank, and phone number of attending physician.

3.5. Installation RSO shall: Make appropriate notifications and coordinate an investigation.

3.6. RAM Incidents. AFI 40-201 describes reportable incidents in detail. Examples of potentially reportable incidents, which may occur at Ramstein AB, are listed in [Attachment 1](#).

3.7. **Potentially overexposed individuals shall:** Be removed from all duties involving radiation exposure until completion of the investigation.

4. Radioactive Recycling/Disposal. Units will coordinate the disposal of all RAM through 86 AMDS/SGPB. Units may not dispose of any quantity of RAM in the Federal Republic of Germany.

5. Quality Assurance, Minimal Requirements.

5.1. Personnel dosimetry action levels serve to determine surveillance and control requirements in [Attachment 2](#). Dosimetry results shall be reviewed quarterly by the installation RSO.

5.2. Annual radiation safety program reviews shall be accomplished by the installation RSO. Results will be presented to the Aerospace Medicine Council, or equivalent, and the Air Force Occupational Safety and Health Council, or equivalent. Reviews will include:

5.2.1. A review of all local publications, operating instructions, and training plans to ensure they are current.

5.2.2. A review of all radiation survey results for the past year to ensure all required surveys have been performed, documented, and appropriate corrective action taken.

5.2.3. A review of all personnel dosimetry results for the past year to ensure adverse trends are noted and appropriate action has been taken.

5.2.4. An update of the RAM inventory and inventory of radiation-producing devices.

5.2.5. A review of all USAF Radioactive Material Permits to ensure currency and compliance with requirements.

ERWIN F. LESSEL III, Brigadier General, USAF
Commander

Attachment 1

A1.1. ALARA Training Guide (reference AFI 48-148 3.3)

A1.1.1. The purpose of this document is to provide initial and refresher training to individuals who work with ionizing radiation sources/producing equipment. It supports the annual training requirements identified in 86 AWI 48-148, Ionizing Radiation Protection, para. 2.4.5. Document training on AF Form 55 or equivalent.

A1.2. ALARA Philosophy and Practice:

A1.2.1. ALARA is an acronym meaning As Low As Reasonably Achievable. ALARA is defined as an approach to radiation protection to manage and control doses (both individual and collective) to the work force and the general public such that they are kept as low as is reasonable, taking into account social, technical, economic, ALARA makes the assumption that all radiation exposure is associated with some risk. For this reason all exposures must be limited as much as is reasonably possible.

A1.3. Discussion of Radiation:

A1.3.1. The amount of radiation an individual receives is called the “dose” and is measured in “rems.” The average individual in the United States accumulates a dose of 0.03 rem from natural sources every year. The dose from natural radiation is higher in some states, such as Colorado, Wyoming, and South Dakota, primarily because of cosmic radiation. There the average individual gets one rem every eight years.

A1.3.2. Natural background radiation levels are also much higher in certain local areas. A dose of one rem may be received in some areas on the beach at Guarapari, Brazil, in only about nine days, and some people in Kerala, India, get a dose of one rem every five months. Many people receive additional radiation for medical reasons. The average individual dose to the United States population from medical sources is .090 rem per year.

A1.3.3. Radiation can also be received from natural sources such as rock or brick structures, from consumer products such as television and glow-in-the dark watches, and from air travel. The average annual dose in the United States from consumer products is 0.00003 rem.

A1.3.4. Radiation, like many things, can be harmful. A large dose to the whole body (such as 600 rems in one day) would probably cause death in about 30 days, but such large doses result only from rare accidents. Control of exposure to radiation is based on the assumption that any exposure, no matter how small, involves some risk. The occupational exposure limits are set so low however; that medical evidence gathered over the past 50 years indicates no clinically observable injuries to individuals due to radiation exposures when the established radiation limits are not exceeded. This was true even for exposures received under the early occupational exposure limits. Thus, the risk to individuals at the occupational exposure levels is considered to be very low. However, it is impossible to say that the risk is zero. To decrease the risk still further, Air Force policy is to keep actual exposures as far below the limits as is reasonably achievable.

A1.3.5. The current exposure limits for people working with radiation have been developed and carefully reviewed by nationally and internationally recognized groups of scientists. It must be remem-

bered, however, that these limits are for adults. Special consideration is appropriate when the individual being exposed is, or may be, an expectant mother, because the exposure of an unborn child may also be involved.

A1.4. Health Risks From Ionizing Radiation Exposure:

A1.4.1. Injury due to irradiation is caused mainly by ionization within the tissues of the body. When radiation interacts with a cell, ionization's and excitations are produced. Based on the site of interaction, the radiation-cellular interactions may be termed as either direct or indirect.

A1.4.2. Direct action occurs when an ionizing particle interacts with and is absorbed by a macromolecule in a cell (DNA, RNA, protein, enzymes, etc.). These macromolecules become abnormal structures, which initiate the events that lead to biological changes.

A1.4.3. Indirect action involves the absorption of ionizing radiation in the medium in which the molecules are suspended. The molecule, which most commonly mediates this action, is water. Through a complex set of reactions the ionized water molecules form free radicals that can cause damage to macromolecules.

A1.4.4. The most important target for radiation in the cell is DNA in the nucleus. Biological effects result when DNA damage is not repaired or is improperly repaired. Extensive damage to DNA can lead to cell death. Large numbers of cells dying can lead to organ failure and death for the individual. Damaged or improperly repaired DNA may develop into lymphoma and cancers in somatic cells. Two kinds of effects may result.

A1.4.5. Acute effects are health effects, the severity of which varies with the dose and for which a threshold is believed to exist. Delayed are health effects that occur randomly and for which the probability of the effect occurring, rather than the severity, is assumed to be a linear function of the dose without threshold.

A1.5. Possible Health Risks To Offspring Of Women Who Were Exposed To Radiation During Pregnancy:

A1.5.1. The prediction that an unborn child would be more sensitive to radiation than an adult is supported by observations for relatively large doses. Large doses delivered before birth alters both physical development and behavior in experimentally exposed animals. A report of the National Academy of Sciences states that short-term doses in the range of 10 to 20 rems cause subtle changes in the nerve cells of unborn and infant rats. The report also states, however, that no radiation-induced changes in development have been demonstrated to result in experimental animals from doses up to about 1 rem per day extended over a large part of the period before birth.

A1.5.2. The National Academy of Sciences also noted that doses of 25 to 50 rems to a pregnant human may cause growth disturbances in her offspring. Such doses substantially exceed, of course, the maximum permissible occupational exposure limits.

A1.5.3. Concern about prenatal exposure (i.e., exposure of a child while in its mother's uterus) at the permissible occupational levels is primarily based on the possibility that cancer (especially leukemia) may develop during the first 10 years of the child's life. Several studies have been performed to evaluate this risk. One study involved the follow-up of 77,000 children exposed to radiation before birth (because of diagnostic abdominal X-rays made for medical purposes during their mother's pregnancy). Another study involved the follow-up of 20,000 such children. In addition, 1292 children who

received prenatal exposure during the bombing of Hiroshima and Nagasaki were studied. Although contradictory results have been obtained, most of the evidence suggests a relationship between prenatal exposure and an increased risk of childhood cancer. The scientific organization called the National Council on Radiation Protection and Measurements (NCRP) recommended that because unborn babies may be more sensitive to radiation than adults, their radiation dose as a result of occupational exposure of the mother should not exceed 0.5 rem. Other scientific groups, including the International Commission on Radiation Protection, have also stressed the need to keep radiation doses to unborn children as low as is reasonably achievable.

A1.5.4. The Air Force has established a policy which is intended to ensure that occupational exposures to pregnant workers are not likely to result in a dose to the unborn child who would exceed the 0.5 rem limit recommended by the NCRP. This policy required that female workers who may be occupationally exposed to radiation: 1) be told about the potential hazards to the child of exposure to doses above this limit recommended by the NCRP; 2) be told of the importance of promptly telling her supervisor if she believes she may be pregnant so that appropriate action may be taken to assure the protection of the fetus from excessive radiation exposures; 3) have suspected pregnancies confirmed by a qualified medical practitioner; and 4) be given an opportunity to ask, and have answered, question on the risks of exposure to herself and her unborn child.

A1.6. Worker Responsibilities:

A1.6.1. Individuals who use radioactive materials assume certain responsibilities in their work. The individual worker is the “first line of defense” in protection of people and the environment against undue risks of radiation exposure and/or contamination. Since the workers, themselves, are the direct handlers of the radioactive material or users of the radiation producing equipment, the final responsibility lies with them for safety and compliance with laws and regulations. For this reason, it is critical that they be aware of the risks, safe practices and requirements for use of radioactive materials and radiation producing equipment.

A1.6.2. Workers are responsible for adhering to all laws, rules, regulations, license conditions and guidelines pertaining to the use of radioactive materials or radiation producing equipment.

A1.6.3. Workers must wear their assigned radiation dosimeter during the use of radioactive materials/producing equipment when directed by the Base Radiation Safety Officer.

A1.6.4. Workers must practice ALARA in their work.

A1.6.5. Workers must report any abnormal occurrences to the unit Radiation Safety Office and Base Radiation Safety Officer.

A1.6.6. Workers are responsible for returning the radiation dosimeter on time and reporting any loss or problems with the dosimeter to the Bioenvironmental Engineering Flight.

A1.6.7. Workers are responsible for informing the Base Radiation Safety Officer of any exposures which have occurred at a previous employer or from employment outside the USAF.

A1.6.8. Workers are responsible for maintaining security of radioactive materials/radiation producing equipment.

A1.7. Maximum Permissible Dose Limits:

A1.7.1. Exposure standards have been established by the NRC and set at a level where apparent injury due to ionizing radiation during a normal lifetime is unlikely. This limit is called the “maximum permissible exposure.” However, personnel should not completely disregard exposures at or below these limits. It is the responsibility of each individual to keep his/her exposure to all radiation as low as is reasonable, and to avoid all exposures to radiation when such exposures are unnecessary.

A1.7.2. The exposure limit for whole body exposures is lower than that for a single organ because all organs and tissues are exposed in a whole body exposure, while only a single organ is involved in the single organ exposure limits. The risk to the organ is incorporated in the exposure calculations, which must be done if organs or tissues are exposed. Maximum permissible exposure limits to external radiation for adult and minor radiation workers are given in the table below.

A1.8. Occupational Radiation Exposure Limits. The doses listed below are taken from 10 CFR 20 and is the absolute maximum dose that can be received.

Table A1.1. Occupational Radiation Exposure Limits

Part of Body	Adult Yearly (mrem)	Minors Yearly (< 18 yrs. age) (mrem)	Adult ALARA Yearly (mrem)
Whole Body, Head and Trunk, Active Blood Forming Organs (TEDE)	5000	500	500
Lens of Eye (LDE)	15,000	1,500	1,500
Extremities (SDE) (Elbows, Forearms, Hands, Knees, Lower Legs, Feet)	50,000	5,000	5,000
Single Organ Dose (TODE)	50,000	5,000	5,000
Skin of Whole Body (SDE)	50,000	5,000	5,000

A1.9. The following definitions describe the new quantities. Note: The types of doses are quantities; the units used for these quantities are the rem or the sievert.

A1.9.1. Dose Equivalent (DE). The product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert.

A1.9.2. Committed Dose Equivalent (CDE). Means the dose equivalent to organs or tissues of reference that will be received from an intake of radioactive materials by an individual during the 50-year period following the intake.

A1.9.3. Effective Dose Equivalent (EDE). It is the sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated.

A1.9.4. Committed Effective Dose Equivalent (CEDE). It is the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues.

A1.9.5. Deep Dose Equivalent (DDE). Applies to external whole-body exposure. It is the dose equivalent at a tissue depth of 1 centimeter (1000 mg/cm²).

A1.9.6. Total Organ Dose Equivalent (TODE). The sum of the CDE and DDE for the maximally exposed organ.

A1.9.7. Shallow Dose Equivalent (SDE). Applies to the external exposure of the skin or an extremity, is taken as the dose equivalent at a tissue depth of 0.007 centimeter (7 mg/cm²), averaged over an area of 1 square centimeter.

A1.9.8. Lens of Eye Dose Equivalent (LDE). Applies to the external exposure of the lens of the eye and is taken as the dose equivalent at tissue depth of 0.3 centimeter (300 mg/cm²).

A1.9.9. Total Effective Dose Equivalent (TEDE). The sum of the deep dose equivalent (for external exposures) and the committed dose equivalent (for internal exposures).

A1.10. Protective Measures. Exposure to external radiation may be controlled by limiting the working time in the radiation field, working at a distance from the source of radiation, inserting shielding between the worker and the source, and by using no more radiation energy than necessary.

A1.11. The USAF Personnel Radiation Dosimetry Program. The Air Force monitors, via the dosimetry program, each military or civilian worker identified by the Radiation Safety Officer as being or potentially being occupationally exposed to levels of ionizing radiation exceeding one-tenth of the occupational limits specified in Title 10, Code of Federal Regulations, Part 20. This program is explained in *AFI 48-125, The US Air Force Personnel Dosimetry Program*.

A1.12. Radiation Incidents/Emergencies. The following are the reporting information necessary to evaluate and respond properly to an abnormal occurrence involving radioactive materials/radiation producing equipment. This information must be reported to the Base Radiation Safety Office at DSN 480-5158, preferable by the Unit RSO.

A1.12.1. Location of incident (building and room number).

A1.12.2. Persons contaminated or exposed, estimate of amount (e.g., 2,000 CPM, 32P, 10 cm² on skin of arm).

A1.12.3. Equipment or radioactive material involved.

A1.12.4. Equipment setting and location of personnel.

A1.13. Examples of Reportable Incidents:

A1.13.1. Any lost, stolen, or otherwise missing radioactive material.

A1.13.2. Any spill that exposes an individual to an unknown amount of external radiation.

A1.13.3. Any unplanned or unexpected event involving radioactive materials.

A1.13.4. Any spill or other unplanned release of radioactive material into the environment.

A1.13.5. Any defect or damage to a radioactive source or device that presents a potential hazard to personnel or the environment. This includes sealed sources with leak test results in excess of 0.005 microcuries (185 becquerel) of radioactive material.

A1.13.6. Known deviations or failure to comply with publications (NRC regulations (10 CFR), DOT regulations (49 CFR), or permit provisions).

A1.13.7. Discovery of additional radioactive materials that require a permit, but for which no permit exists.

A1.13.8. All levels of radiation or concentrations of radioactive material exceeding 10 times the applicable limit of a USAF permit, a NRC license, or 10 CFR 20.

A1.13.9. In restricted areas, levels of radiation in excess of any applicable limit of the permit.

Attachment 2

A2.1. ALARA Action Levels. The following levels have been established to ensure exposures are kept ALARA:

Table A2.1. ALARA Action Levels

SHOP	OVER EXP. ACTION LEVEL	ABNORMAL EXP. ACTION LEVEL	INVESTIGATIVE ACTION LEVEL	PREGNANT FEMALE ACTION LEVEL
Medical Maint	5 rem/yr	1250 mrem/qtr	50 mrem/qtr	10 mrem/mo
Radiology	5rem/yr	1250 mrem/qtr	50 mrem/qtr	10 mrem/mo
NDI	5 rem/yr	1250 mrem/qtr	50 mrem/qtr	10 mrem/mo

A2.2. Pregnant Female Action Level. Personnel dosimetry result, if continued for the term of pregnancy, would exceed the 500 mrem exposure limit for the fetus. Personnel dosimetry results above this level must be jointly investigated by the base, unit, and functional area RSOs.

A2.3. Contingency Action Level. During emergency response actions to potential radiological/nuclear threats where ionizing radiation is present, worker exposures should be limited to 5 rem as directed by AFI 48-148. On-site workers (i.e. EOD) will be outfitted with direct-reading digital audio dosimeters, as well as TLDs (so their exposures can be added to their medical records).